

The Youth Risk Behavior Surveillance System: Measuring Health-risk Behaviors

Laura Kann, PhD

Objective: To measure priority health-risk behaviors among youth. **Methods:** The Youth Risk Behavior Surveillance System (YRBSS) monitors priority health-risk behaviors among youth. **Results:** In 1999, many high school students practiced behaviors that contribute to leading health problems -- 16.4% rarely or never wore safety belts and, during the past 30 days, 17.3%

carried a weapon, 34.8% smoked cigarettes, and 26.7% used marijuana. Also, 49.9% had had sexual intercourse. One quarter (26.0%) were at risk for becoming overweight or were overweight. **Conclusion:** YRBSS data are used to improve policies and programs to reduce priority health-risk behaviors among youth.

Am J Health Behav 2001;25(3):272-277

In the United States, 72% of all deaths among youth 10-24 years of age result from only 4 causes: motor vehicle crashes (31%), other unintentional injuries (11%), homicide (17%), and suicide (13%).¹ Substantial morbidity and social problems also result from the approximately 800,000 to 900,000 pregnancies that occur each year among females aged 15-19 years² and the estimated 3 million cases of sexually transmitted diseases (STDs) that occur each year among persons aged 10-19 years.³ Among adults aged ≥ 25 years, two thirds of all deaths in

the United States result from cardiovascular disease (42%) and cancer (24%).¹

The leading causes of mortality and morbidity among both youth and young adults in the United States are related to the following 6 categories of health behavior: behaviors that contribute to unintentional injuries and violence; tobacco use; alcohol and other drug use; sexual behaviors that contribute to unintended pregnancy and STDs, including human immunodeficiency virus (HIV) infection; unhealthy dietary behaviors; and physical inactivity. These behaviors are frequently interrelated and often are established during youth and extended into adulthood.

To monitor the priority health-risk behaviors in each of these categories among youth and young adults, CDC implemented the Youth Risk Behavior Surveillance System (YRBSS) in 1989.⁴ A questionnaire measuring the 6 categories of behavior was developed after input from state and local health and education agency representatives and experts in each categorical area. The questionnaire also underwent extensive focus-group and field-test work at CDC's Ques-

Laura Kann, PhD, Chief, Surveillance and Evaluation Research Branch, Division of Adolescent and School Health, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, Atlanta, GA.

Address correspondence to Dr. Kann, Surveillance and Evaluation Research Branch, Division of Adolescent and School Health, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, 4770 Buford Highway, NE, MS-K33, Atlanta, GA 30341. Email: LKK1@CDC.GOV

tionnaire Design Research Laboratory to further clarify and refine the wording of the questions and their appropriateness for youth. In 1992⁵ and 2000, methodological studies were conducted to measure the reliability of the questions. In both studies, the questions were generally found to produce reliable data from high school students. In 2001, the YRBSS questionnaire contains 87 multiple-choice questions and has about a 7th-grade reading level.

The YRBSS includes national, state, territorial, and local school-based surveys of high school students. National surveys were conducted in 1990, 1991, 1993, 1995, 1997, and 1999. Comparable state and local surveys were first conducted in 1990 when 23 states and 9 large cities participated. In 1991, 26 states, 2 territories, and 11 large cities conducted surveys; in 1993, 40 states, 2 territories, and 14 large cities conducted surveys; in 1995, 40 states, 4 territories, and 17 large cities conducted surveys; in 1997, 38 states, 4 territories, and 17 large cities conducted surveys; and in 1999, 41 states, 4 territories, and 17 large cities conducted surveys. The YRBSS also includes a national household survey conducted in 1992, a national survey of college students conducted in 1995, a national survey of students attending alternative schools conducted in 1998, and special population surveys such as surveys among schools sponsored by the Bureau of Indian Affairs and Navajo Nation. The rest of this manuscript focuses predominantly on data from the national school-based surveys of high school students.

METHODS

Sampling

The national Youth Risk Behavior Surveys have all used essentially the same sample design and methodology. In 1999, a 3-stage cluster sample design was employed to produce a nationally representative sample of students in grades 9 through 12. The first stage sampling frame contained 1,270 primary sampling units (PSUs), consisting of large counties or groups of smaller, adjacent counties. From the 1,270 PSUs, 52 were selected from 16 strata formed on the basis of the degree of urbanization and the relative percentage of black and Hispanic students in the PSU. The PSUs were selected with probability proportional to school enrollment

The YRBSS includes national, state, territorial, and local school-based surveys of high school students.

size. At the second sampling stage, 187 schools were selected with probability proportional to school enrollment size. To enable separate analysis of data for black and Hispanic students, schools with substantial numbers of black and Hispanic students were sampled at higher rates than all other schools. The third stage of sampling consisted of randomly selecting 1 or 2 intact classes of a required subject (eg, English or social studies) from grades 9 through 12 at each chosen school. All students in the selected classes were eligible to participate in the survey.

A weighting factor was applied to each student record to adjust for nonresponse and for the varying probabilities of selection, including those resulting from the oversampling of black and Hispanic students. The weights were scaled so that (a) the weighted count of students was equal to the total sample size and (b) the weighted proportions of students in each grade matched national population proportions. The national data are representative of students in grades 9 through 12 in public and private schools in the 50 states and the District of Columbia. SUDAAN was used to compute 95% confidence intervals, which were used to determine differences between gender and race/ethnicity subgroups at the $p < .05$ level.⁶ Differences between prevalence estimates were considered statistically significant if the 95% confidence intervals did not overlap. Secular trends were analyzed using logistic regression analyses that controlled for sex, grade, and race/ethnicity and that simultaneously assessed linear and higher order (ie, quadratic) time effects.⁷ Quadratic trends suggest a significant but nonlinear trend in the data over time. When the trend includes significant linear and quadratic components, the data demonstrate some nonlinear variation (eg, leveling off or change of direction) in addition to a linear

***For the 1999 national
YRBS, 15,349
questionnaires were
completed in 144 schools.***

effect.

For the 1999 national YRBS, 15,349 questionnaires were completed in 144 schools. The school response rate was 77%, and the student response rate was 86%, resulting in an overall response rate of 66%.

Data Collection

Survey procedures were designed to protect the students' privacy by allowing for anonymous and voluntary participation. The students completed the self-administered questionnaire in their classrooms during a regular class period, recording their responses directly on a computer-scannable booklet. Local parental permission procedures were followed before survey administration.

**Selected Results From the 1999
National YRBS**

Behaviors that contribute to unintentional injuries. Nationwide, 16.4% of students had rarely or never worn seat belts when riding in a car or truck driven by someone else. Male students (20.8%) were significantly more likely than female students (11.9%) to have rarely or never worn seat belts.

Nationwide, 70.8% of students had ridden a bicycle during the 12 months preceding the survey. Of these students, 85.3% rarely or never wore a bicycle helmet. Black students (91.9%) were significantly more likely than white students (84.3%) to have rarely or never worn a bicycle helmet.

During the 30 days preceding the survey, one third (33.1%) of students nationwide had ridden one or more times with a driver who had been drinking alcohol. Hispanic students (39.5%) were significantly more likely than white students (32.4%) to have ridden with a driver who had been drinking alcohol.

During the 30 days preceding the survey, 13.1% of students nationwide had

driven a vehicle one or more times after drinking alcohol. Male students (17.4%) were significantly more likely than female students (8.7%) to have driven after drinking alcohol. White students (14.6%) were significantly more likely than black students (7.9%) to have driven after drinking alcohol.

Behaviors that contribute to violence.

Nationwide, 17.3% of students had carried a weapon (eg, a gun, knife, or club) and 4.9% of students had carried a gun on ≥ 1 of the 30 days preceding the survey. Male students (28.6%) were significantly more likely than female students (6.0%) to have carried a weapon, and male students (9.0%) were significantly more likely than female students (0.8%) to have carried a gun.

Among students nationwide, 35.7% had been in a physical fight one or more times during the 12 months preceding the survey. Male students (44.0%) were significantly more likely than female students (27.3%) to have been in a physical fight. Hispanic students (39.9%) were significantly more likely than white students (33.1%) to have been in a physical fight.

Nationwide, 14.5% of students had made a specific plan to attempt suicide during the 12 months preceding the survey. Female students (18.3%) were significantly more likely than male students (10.9%) to have made a suicide plan. Hispanic students (17.7%) were significantly more likely than white and black students (12.4% and 11.7%, respectively) to have made a suicide plan.

Nationwide, 8.3% of students had attempted suicide one or more times during the 12 months preceding the survey. Female students (10.9%) were significantly more likely than male students (5.7%) to have attempted suicide. Hispanic students (12.8%) were significantly more likely than black and white students (7.3% and 6.7%, respectively) to have attempted suicide.

Tobacco use. Nationwide, 70.4% of students had ever tried cigarette smoking (even 1 or 2 puffs) (ie, lifetime cigarette use). More than one third of students (34.8%) had smoked cigarettes on ≥ 1 of the 30 days preceding the survey (ie, current cigarette use). White and Hispanic students (38.6% and 32.7%, respectively) were significantly more likely than black students (19.7%) to report current cigarette use.

Nationwide, 16.8% of students had smoked cigarettes on ≥ 20 of the 30 days preceding the survey (ie, current frequent cigarette use). White students (20.2%) were significantly more likely than Hispanic and black students (10.4% and 7.0%, respectively) to report current frequent cigarette use.

Nationwide, 7.8% of students had used smokeless tobacco (chewing tobacco or snuff) on ≥ 1 of the 30 days preceding the survey (ie, current smokeless tobacco use). Male students (14.2%) were significantly more likely than female students (1.3%) to report current smokeless tobacco use. White students (10.4%) were significantly more likely than Hispanic and black students (3.9% and 1.3%, respectively) to report current smokeless tobacco use.

Nationwide, 17.7% of students had smoked cigars, cigarillos, or little cigars on ≥ 1 of the 30 days preceding the survey (ie, current cigar use). Male students (25.4%) were significantly more likely than female students (9.9%) to report current cigar use. White students (18.8%) were significantly more likely than black students (13.7%) to report current cigar use.

Alcohol and other drug use. Nationwide, 81.0% of students had had at least one drink of alcohol during their lifetime (ie, lifetime alcohol use). Hispanic students (83.4%) were significantly more likely than black students (74.8%) to report lifetime alcohol use.

Half of all students (50.0%) nationwide had had at least one drink of alcohol on ≥ 1 of the 30 days preceding the survey (ie, current alcohol use). Hispanic and white students (52.8% and 52.5%, respectively) were significantly more likely than black students (39.9%) to report current alcohol use.

Nationwide, 31.5% of students had had five or more drinks of alcohol on ≥ 1 occasions during the 30 days preceding the survey (ie, episodic heavy drinking). Male students (34.9%) were significantly more likely than female students (28.1%) to report episodic heavy drinking. White and Hispanic students (35.8% and 32.1%, respectively) were significantly more likely than black students (16.0%) to report episodic heavy drinking.

Nationwide, 47.2% of students had used marijuana during their lifetime (ie, lifetime marijuana use). Male students

**Male students (14.2%)
were significantly more
likely than female
students (1.3%) to report
current smokeless
tobacco use.**

(51.0%) were significantly more likely than female students (43.4%) to report lifetime marijuana use.

One fourth (26.7%) of students had used marijuana one or more times during the 30 days preceding the survey (ie, current marijuana use). Male students (30.8%) were significantly more likely than female students (22.6%) to report current marijuana use.

Nationwide, 9.5% of students had used some form of cocaine (eg, powder, "crack," or "freebase") during their lifetime (ie, lifetime cocaine use). Hispanic and white students (15.3% and 9.9%, respectively) were significantly more likely than black students (2.2%) to report lifetime cocaine use, and Hispanic students (15.3%) were significantly more likely than white students (9.9%) to report this behavior.

Nationwide, 14.6% of students had sniffed glue, breathed the contents of aerosol spray cans, or inhaled paints or spray to get high during their lifetime (ie, lifetime inhalant use). Overall, white and Hispanic students (16.4% and 16.1%, respectively) were significantly more likely than black students (4.5%) to report lifetime inhalant use.

Nationwide, 2.4% of students had used heroin during their lifetime (ie, lifetime heroin use). Male students (3.5%) were significantly more likely than female students (1.3%) to report lifetime heroin use.

Nationwide, 9.1% of students had used methamphetamines during their lifetime (ie, lifetime methamphetamine use). Hispanic and white students (11.3% and 10.3%, respectively) were significantly more likely than black students (1.7%) to report lifetime methamphetamine use.

Sexual behaviors. Half (49.9%) of all students had had sexual intercourse during their lifetime. Black students (71.2%) were significantly more likely than His-

Nationwide, 16.2% of all students had had sexual intercourse during their lifetime with 4 or more sex partners.

panic and white students (54.1% and 45.1%, respectively) to have had sexual intercourse.

Nationwide, 16.2% of all students had had sexual intercourse during their lifetime with 4 or more sex partners. Male students (19.3%) were significantly more likely than female students (13.1%) to have had 4 or more sex partners. Black students (34.4%) were significantly more likely than Hispanic and white students (16.6% and 12.4%, respectively) to have had 4 or more sex partners.

Nationwide, 36.3% of all students had had sexual intercourse during the 3 months preceding the survey (ie, currently sexually active). Black students (53.0%) were significantly more likely than Hispanic and white students (36.3% and 33.0%, respectively) to be currently sexually active.

Among currently sexually active students nationwide, 58.0% reported that either they or their partner had used a condom during last sexual intercourse. Male students (65.5%) were significantly more likely than female students (50.7%) to report condom use. Black students (70.0%) were significantly more likely than Hispanic and white students (55.2% and 55.0%, respectively) to report condom use.

Among currently sexually active students nationwide, 16.2% reported that either they or their partner had used birth control pills before last sexual intercourse. Female students (20.4%) were significantly more likely than male students (11.8%) to report birth control pill use. White students (21.0%) were significantly more likely than Hispanic and black students (7.8% and 7.7%, respectively) to report birth control pill use.

Dietary behaviors. Nationwide, 16.0% of students were at risk for becoming overweight (ie, having a BMI \geq the 85th percentile and $<$ than the 95th percentile

by age and sex).⁸ Male students (17.5%) were significantly more likely than female students (14.4%) to be at risk for becoming overweight. Black students (22.0%) were significantly more likely than white students (14.4%) to be at risk for becoming overweight.

Nationwide, 9.9% of students were overweight (ie, having a BMI \geq the 95th percentile by age and sex).⁸ Male students (11.9%) were significantly more likely than female students (7.9%) to be overweight.

Physical activity. Nearly two thirds (64.7%) of students nationwide had participated in activities that made them sweat and breathe hard for at least 20 minutes on ≥ 3 of the 7 days preceding the survey (ie, vigorous physical activity). Male students (72.3%) were significantly more likely than female students (57.1%) to report vigorous physical activity. White students (67.4%) were significantly more likely than black students (55.6%) to report vigorous physical activity.

Nationwide, 57.2% of students watched television ≤ 2 hours per day during an average school day. White students (65.8%) were significantly more likely than Hispanic or black students (47.8% and 26.3%, respectively) to have watched television ≤ 2 hours per day, and Hispanic students (47.8%) were significantly more likely than black students (26.3%) to report this behavior.

Nationwide, 56.1% of students were enrolled in a physical education (PE) class, and 29.1% of students attended PE class daily.

Trends Over Time

Trend analyses of selected risk behaviors indicated significantly decreasing linear trends ($p < .05$) between 1991 or 1993 and 1999 in the percentage of students who never or rarely wore a bicycle helmet, never or rarely used seat belts, rode with a driver who had been drinking alcohol, carried a gun, participated in a physical fight, ever had sexual intercourse, had sexual intercourse with ≥ 4 partners, and attended physical education classes daily. The percentage of students who carried a weapon decreased linearly, but also showed a significant quadratic trend with leveling between 1997 and 1999.

Significantly increasing linear trends between 1991 and 1999 were shown for

current frequent cigarette use, lifetime marijuana use, and condom use. The percentage of students who reported current cigarette use increased linearly, but also showed a significant quadratic trend with leveling or a possible decline between 1995 and 1999.

CONCLUSION

Since 1991, the prevalence of many injury-related behaviors and sexual behaviors has improved among high school students throughout the United States. Fewer students are at risk for motor vehicle crashes, homicide, unintended pregnancies, and sexually transmitted diseases, including HIV infection. Although current cigarette smoking was more common in 1999 than at the beginning of the decade, current cigarette smoking rates have been level or possibly declining since 1995. Nonetheless, too many high school students nationwide continue to practice behaviors that place them at risk for serious health problems.

Findings for gender and race/ethnicity subgroups can assist in identifying the need for education and services based on a higher prevalence of risk behaviors. However, the underlying causes (eg, economic factors, education levels, or cultural influences) for subgroup differences cannot be addressed with the YRBSS. The association between race/ethnicity and some risk behaviors is attenuated after controlling for socioeconomic status.⁹ Additional research is needed to assess the effect of education, socioeconomic, cultural, and race/ethnicity factors on the prevalence of health risk behaviors among youth.

The YRBSS continues to be a primary source of data on the health-risk behaviors of youth at the national, state, and local levels. For example, YRBSS data will be used to monitor 16 national health objectives for 2010 and 3 of the 10 leading health indicators.¹⁰ YRBSS data are used by states and school districts to report on student drug use for the US Department of Education's Safe and Drug-Free Schools Program. More specifically, in Dallas, YRBSS data on the lack of physical activity among high school students led to the development of an afterschool physical

education program. In Louisiana, YRBSS data were used to help obtain funding for the Governor's Commission on Teen Pregnancy Prevention. In Tennessee, YRBSS data were used by state legislators to craft the Coordinated School Health Improvement Act. In Wisconsin, YRBSS data were published in the state's medical journal to help educate young physicians about adolescent health issues. In Hawaii, YRBSS data were used as the basis for the development of a new teaching guide for health education being used statewide. In Montana, YRBSS data were used to help track state progress in reducing tobacco use. Continued support for the YRBSS will help assure the success of these and other public health and school health programs. ■

REFERENCES

1. Murphy SL. Deaths: final data for 1998. *Natl Vital Stat Rep* 2000;48(11):1-108.
2. CDC. National and state-specific pregnancy rates among adolescents—United States, 1995-1997. *Morb Mortal Wkly Rep* 2000;49(27):605-611.
3. Institute of Medicine. *The Hidden Epidemic. Confronting Sexually Transmitted Diseases*. Washington, DC: National Academy Press, 1997.
4. Kolbe LJ, Kann L, Collins JL. Overview of the Youth Risk Behavior Surveillance System. *Public Health Rep* 1993;108(suppl 1):2-10.
5. Brener ND, Collins JL, Kann L, Warren CW, Williams BI. Reliability of the Youth Risk Behavior Survey questionnaire. *Am J Epidemiol* 1995;141:575-580.
6. Shah BV, Barnwell BG, Bieler GS. *SUDAAN: User's Manual, Release 7.5, 1997*. Research Triangle Park, NC: Research Triangle Institute; 1997.
7. Hinkle DE, Wiersma W, Jurs SG. *Applied Statistics for the Behavioral Sciences*. 2nd ed. Boston, Massachusetts: Houghton Mifflin, 1988;383-389.
8. Must A, Dallal GE, Dietz WH. Reference data for obesity: 85th and 95th percentiles of body mass index (wt/ht²) and triceps skinfold thickness. *Am J Clin Nutr* 1991;53(4):839-846.
9. Lowry R, Kann L, Collins JL, Kolbe JL. The effect of socioeconomic status on chronic disease risk behaviors among US adolescents. *JAMA* 1996;276:792-797.
10. U.S. Department of Health and Human Services. *Healthy People 2010* (conference edition - two volumes). Washington, DC: U.S. Department of Health and Human Services, 2000.